I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being transmitted via the Office electronic filing system in accordance with § 1.6(a)(4).

Dated: October 6, 2008 Signature: /Carl A. Forest/ (Carl A. Forest)

Docket No. 020008.0112PTUS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Ofer Sneh

Application No.: 10/563,519 Confirmation No.: 8637

Filed: June 20, 2006 Art Unit: 1792

For: APPARATUS AND METHOD FOR DOWNSTREAM PRESSURE CONTROL AND SUB-ATMOSPHERIC REACTIVE GAS ABATEMENT

Examiner: K.T. Chen

DECLARATION OF OFER SNEH

I, Ofer Sneh, hereby declare:

1. I am Founder of Sundew Technologies, LLC as well as Management Committee member and Officer of the same organization. My responsibilities include setting and executing guidelines, priorities and road mapping of the company's technology, product development, prototyping, engineering and manufacturing, intellectual property, customer and vendor relations, and research collaboration programs. All statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true.

2. I earned a Ph.D. in chemical physics in 1992 and have worked in this technology for over eighteen years, focusing in the area of deposition processes, and in particular atomic layer deposition (ALD). I have published more than thirty papers and presentations on the subject of deposition processes and have more than twenty-three issued US patents in the field, and have another thirty-two patents pending. A copy of my resumé with a partial list of my papers and patents is attached hereto as Exhibit A.

3. I am an inventor in the above-identified patent application (hereinafter "the application") and Sundew Technologies, LLC (hereinafter "Sundew") is the assignee of the application.

4. I submit this Declaration to present to the Examiner, in an authenticated manner, facts concerning the relevance of the references cited in the Office Action dated June 5, 2008 (hereinafter "the Office Action") and the patentability of the claims.

5. I have read the present claims of the application, the Office Action, and the references cited by the Examiner, i.e., U.S. Patent No. 6,391,146 issued May 21, 2002 to Bhatnagar et al. (hereinafter "Bhatnagar et al.") and U.S. Patent No. 6,663,025 issued December 16, 2003 to Halsey et al. (hereinafter "Halsey et al.").

6. The Office Action totally ignores the heart of the invention: the use of a combination of an immobile flow restriction device and a feedback controlled flow of gas for downstream pressure control in an active system that is inherently susceptible to fast pressure fluctuations.

7. As thoroughly described in our specification, commonly implemented methods of downstream pressure control are driven to instability by a downstream abatement module (or any other source of pressure instability faster changing than several seconds). Specifically, the abatement process involves significant and fast pressure fluctuations driven by the abatement process. The pressure fluctuations are driven by the abatement process that converts larger molecules into a much larger number of inert by-product molecules.

8. For example, the process that abates trimethylaluminum ($Al(CH_3)_3$) with ozone converts 2 trimethylaluminum molecules and 6 ozone molecules into a solid Al_2O_3 unit, 2 CO_2 molecules, 4 CH_4 molecules, 1 H_2O molecule, and 6 oxygen molecules. All together, 8 gas molecules are converted into 13 molecules, a >60% increase! If the

exhaust effluent carries significant concentrations of reactive and/or hazardous chemicals, an efficient abatement process can drive the downstream pressure up significantly; and fluctuations in the concentration of by-products and reactants which fact-of-life exist in all of those systems will drive significant pressure fluctuations within the abatement-module.

9. The flow out of the process chamber depends on the conductance, C, between the process chamber and the downstream abatement manifold and the respective pressure differential, ΔP. The flow, Q, is given by: $Q = C \times \Delta P$. Accordingly, ΔP fluctuations impact the flow out of the process chamber and, therefore, impacts the pressure in the process chamber.

10. A conventional (prior art) pressure control system implementing a single throttle valve is substantially too slow to respond to fast, abatement-related pressure fluctuations; and that is the statement of the problem in the prior art which we were able to solve in our invention. For example, the first paragraph of our Summary of the Invention reads: "It is the objective of the present invention to provide a method for downstream pressure control with fast response. It is another objective of our invention to provide apparatus and method for performing downstream pressure control without the usage of moving mechanical devices and with optimized and smooth flow passage."

11. As a result of the above, a single throttle valve can be driven into oscillations and instability that result in process pressure instability and backflow from the abatement module into the process chamber due to unavoidable sequences of transient process pressure drops, while a lagging behind throttle valve is on the "opening course" coincident with a pressure surge in the abatement module. Additionally, throttle valves in fluidic contact with an abatement chamber that converts reactive chemicals into solid inert deposits, which are the focus of our invention, generate enormous counts of particles from the coated bottom of the throttling "flap" during motion.

12. The invention avoids the valve shown in the only relevant art cited by the Examiner (Bhatnagar et al.) and provides a novel alternative method for downstream pressure control. Independent claims 1, 5, and 16 specifically claim this advance in that they recite that the first flow restriction element (FRE) is an immobile flow restricting element.

13. The fact is that alternative downstream pressure control was never taught before; is new, innovative, and patentable; and has not been considered by the Examiner.

14. Unlike a throttle valve, the Pressure Control Chamber (PCC) specified in claims 1, 5, and 16 achieves pressure control by controlling the flow of gas into the PCC; therefore, it essentially has no theoretical speed limitations. This feature is also in claims 1, 5, and 16 and translates into practical designs with response time in the milliseconds, at least 100 times faster than throttle valves (which respond on several seconds time scale, at best). These response times essentially accommodate all practical pressure transients in a practical process apparatus. Nowhere is this disclosed in the prior art.

15. The Office Action rejects claims 1 and 5 over Bhatnagar et al. in view of Halsey et al. The Office Action alleges that the throttle valve 82 in Bhatnagar et al. reads on the first flow restricting element in claim 1 and admits that claim 1 does not include the limitation that this FRE is an immobile flow restricting element. However, the Office Action alleges that the cited references teach diffuser 200 of Halsey et al. can be substituted for the throttle valve 82 of Bhatnagar et al. This is absolutely incorrect.

16. Halsey et al. teaches that item 200 is a specific design of a diffuser, the purpose of which is to reduce flow velocity from a process chamber to a pump when a process chamber is vented. One skilled in the art would not think such a diffuser could replace a throttle valve.

17. Claim 16 also covers another aspect of the invention, namely putting an abatement control element in the PCC. The Office Action attempts to find the claim in Bhatnagar et al. by calling the gas energized reactor 210 a PCC. Those skilled in the art know that a gas energized reactor is anything but a PCC. Pressure is not controlled in a gas energized reactor for the reasons discussed above. That reason impeded successful implementation of "gas energized reactors" or other forms of attempted downstream abatement at the sub-atmospheric pressure range (see US Patent No. 4,735,633) due to the impact on the process chamber.

18. Assuming for the sake of argument that reactor 210 is a PCC, to create consistency in interpretation, one runs into the problem recognized by the Office Action: that Bhatnagar et al. does not disclose a second FRE located in serial fluidic communication downstream from the PCC. The Office Action gets around this by arguing that, because there is a throttle valve at the inlet 211 of the gas energized reactor, one skilled in the art might also put a second throttle valve between the outlet of the gas energized reactor and the pumps "to prevent further backflow of effluent". There is no basis for this. It is merely an attempt to find the invention in the reference. Again, the key is that, without the innovative downstream pressure control taught by our invention, all attempts to treat the exhaust gas downstream from the process chamber will have an impact on the process chamber which is unacceptable. There is a prohibitive problem in the prior art that our invention fixes.

19. There is a reason for the throttle valve between the reactor and the process chamber in Bhatnagar et al. That is, slowly varying conductance relating to the temperature of the throttle valve and the chamber combined with upstream flow variations are adequately handled by throttle valves to avoid process variations from pressure changes and pressure impacted parameters such as plasma impedance. However, in such prior art setups, if designed properly, there would be no issues of backflow from the pump, so the "motivation" alleged by the Office Action cannot exist.

20. The Office Action also says that in the Bhatnagar et al. patent process chamber 25 and PCC are formed as compartments within a single process vessel. However, FIG. 1, which the examiner cites, shows a break line between process chamber 25 and the alleged PCC 85. Based on this drawing and the specification, one skilled in the art would recognize from FIG. 1 that 85 is a conduit, such as a tube connecting to separate vessels.

21. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Sept. 29th, 2008
Date

Ofer Sneh